REMARKS

Claims 66-103 are pending herein. Claims 1-65 have been cancelled without prejudice or disclaimer in favor of new claims 66-103. New independent claim 66 corresponds to original claims 1-3, 6, 16, 44 and 45. New independent claim 73 corresponds to original claims 1-3, 6, 18, 44 and 45. New independent claim 80 corresponds to original claims 1-3, 6, 20, 44 and 45. New independent claim 87 corresponds to original claims 1-3, 6, 22, 44 and 45. New independent claim 94 corresponds to original claims 1-3, 6, 24, 44 and 45. New independent claim 101 corresponds to original claims 1-3, 41, 44 and 45.

For the reasons explained below, all of the prior art rejections asserted in the Office Action have been overcome, and many are simply now moot in view of the cancellation of claims 1-65 and the addition of new claims 66-103. In light of Applicants' earnest effort to reduce the number of issues and clarify the patentable distinctions of the present invention over the prior art of record (discussed below), in the event that any of new claims 66-103 are rejected in a subsequent Office Action, the PTO is requested to apply a manageable and reasonable number of prior art references.

New formal drawings of Figs. 3-5, 8, 16, 17, 19-21, 23, 24, 26-28, 30, 34, 38 and 40 are submitted herewith and change the terms "impregnate," "impregnated," "impregnating" and "impregnation" to --infiltrate--, --infiltrated--, --infiltrating-- and --infiltration--, respectively. The terminology used in the above-identified drawings now corresponds to the language used throughout the specification and claims. Entry of the new formal drawings is respectfully requested.

1. Claims 23, 25, 40 and 42 were rejected under §112, second paragraph in paragraphs 1-3 of the Office Action. These rejections are moot in light of new claims 66-103 submitted above. To the extent that these §112 rejections might be applied against the new

claims, they are respectfully traversed.

With respect to original claims 23 and 40, the phrase "and the like" does not appear in any of the new claims 66-103.

With respect to original claim 25, new claim 95 corresponds to original claim 25 and recites that an element is added to the metal component of the heat sink material to improve the coefficient of thermal conductivity. The added element forms an alloy with and is deposited on the surface of the heat sink metal after a heat treatment and reaction with the carbon component of the heat sink material (see specification page 9, lines 10-17).

With respect to original claim 42, new claim 102 corresponds to original claim 42 and recites that an element is added to the heat sink metal and forms a carbide layer on the basis of a reaction at least between the carbon or the graphite and the added element.

Reconsideration and withdrawal of the §112, second paragraph rejections are respectfully requested.

2. Claims 1-3, 5-8, 11-15, 26-30 and 44-65 were rejected under §102(b) over Hitachi (JP 56-161647) or Maruyama et al. or Weeks, Jr. or Pechiney (JP 4-329845) or Dermarker et al. (see paragraphs 6 and 7 of the Office Action). Claims 1-8, 11-15, 26-30 and 44-65 were rejected under §102(b) over Montesano et al. or Burnham et al. or Wei et al. (*Improvement of Wear Resistance of Pulsed Laser Deposited Diamond-like Carbon Films Through Incorporation of Metals*, Materials Science and Engineering B53 (1998) 262-266) (see paragraph 9 of the Office Action). Claims 1-3, 5, 14, 26-28, 30 and 44 were rejected under §102(b) over Klages et al. (*Microstructure and Physical Properties of Metal-Containing Hydrogenated Carbon Films*, Materials Science Forum Vols. 52 & 53 (1989) pp 609-644) (see paragraph 12 of the Office Action). Claims 1, 2, 4, 14, 26-28, 30 and 44 were rejected under §102(b) over Ferrando et al. (see paragraph 13 of the Office Action). Claims 1, 2 and

4-65 were rejected under §102(e) over Nishibayashi (U.S. Patent No. 6,171,691) or Nishibayashi (U.S. Patent No. 6,031,285) or Shi et al. (see paragraph 15 of the Office Action).

The cancellation of claims 1-65 renders the above-identified rejections moot. In particular, the subject matter of one or more of the original dependent claims, none of which were rejected in paragraphs 7, 9, 12, 13 or 15 of the Office Action, has been added to each of new pending independent claims 66, 73, 80, 87, 94 and 101.

3. Claims 1-3, 5-16, 18-22, 24-33, 35-39 and 41-65 were rejected under §102(a) over Hitachi (JP 11-061292) in paragraph 5 of the Office Action. Claims 1-65 were rejected under §102(b) over Osaka (JP 10-168502) or Newkirk et al. or Colella et al. or Tsuji et al. (U.S. Patent No. 4,425,315) or Tsuji et al. (U.S. Patent No. 4,333,986) in paragraphs 8 and 11 of the Office Action. Claims 1-8, 11-15, 20, 21, 26-30 and 44-65 were rejected under §102(b) over Supan et al. in paragraph 10 of the Office Action. Claims 1-3 and 5-65 were rejected under §102(e) over Polese et al. or Klett et al. or Gungor et al. in paragraph 14 of the Office Action.

The cancellation of claims 1-65 renders the above-identified rejections moot. To the extent that the rejections asserted in paragraphs 5, 8, 10, 11 and 14 of the Office Action might be applied against new claims 66-103, they are respectfully traversed.

Pending independent claims 66, 73, 80, 87 and 94 each recite, among other things, that a porous sintered member is obtained by sintering a carbon or graphite material to form a network. A metal is infiltrated into the network to form the claimed heat sink material. Applicants respectfully submit that the claimed metal infiltration process provides a heat sink material that is structurally distinct from the applied art of record (discussed below).

Pending independent claims 66, 73, 80, 87 and 94 also each recite that the heat sink material includes an average coefficient of thermal conductivity of not less than 180 W/mK in directions along three axes that are orthogonal to one another. Alternatively, the coefficient of thermal conductivity in a direction of any axis is not less than 180 W/mK. Additionally, a ratio of 1:5 exists between an axial direction in which the coefficient of thermal conductivity is a minimum value and an axial direction in which the coefficient of thermal conductivity is a maximum value.

JP '292 discloses that a copper-carbon fiber composite is formed by incorporating a metallic element into the interfaces between a copper matrix and carbon fibers. The composite is produced by mixing Cu powder with carbon fibers and a powder of the metallic element and press-compacting the mixture while heating.

JP '502, Newkirk and Colella each disclose a copper-carbon composite.

Tsuji '315 and '986 each disclose forming compositions including diamond crystals and a catalytic metal, such as Al or Ti.

Polese, Klett, Supan and Gungor each disclose a metal-diamond composite.

It is respectfully submitted that none of the above-cited prior art references discloses or suggests a porous sintered carbon or graphite member that includes a network infiltrated with a metal to form a heat sink material, as claimed. Furthermore, there is no disclosure or suggestion of controlling the coefficient of thermal conductivity of the heat sink material to be within a certain value in a direction along any axis or an average value along three axes in directions orthogonal to one another, as claimed.

Moreover, it is respectfully submitted that the cited prior art references do not disclose or suggest that any ratio exists between an axial direction in which the coefficient of thermal conductivity is a minimum value and an axial direction in which the coefficient of thermal

conductivity is a maximum value, let alone not more than 1:5, as claimed.

The PTO contends that the claimed coefficient of thermal conductivity features discussed above are inherently disclosed in the prior art (see page 3, paragraph 5 of the Office Action, for example). However, it is respectfully submitted that the PTO has not identified any specific disclosure in the applied prior art references that would have led skilled artisans to believe that the above-discussed thermal conductivity properties would necessarily exist in the prior art composite materials. The PTO cannot simply assert "inherency" without any accompanying explanation in support thereof.

Furthermore, the claimed process of metal-infiltrating a sintered carbon or graphite network is demonstrably different from the processes used to form the composite materials disclosed in the cited prior art, and leads to structurally distinct products. Therefore, it is respectfully submitted that skilled artisans would not have expected that the claimed thermal conductivity properties, which are obtained through the metal-infiltration process of the present invention, would necessarily be present in prior art composites formed by entirely different processes.

In the event that the PTO continues to assert that the above-discussed thermal conductivity features are inherent in the prior art, the PTO is requested to identify specific disclosure in the prior art and explain why skilled artisans would have understood that the claimed thermal conductivity properties would inherently result.

With respect to new claim 101, a carbide layer is formed on a surface of the carbon or graphite. Notwithstanding that various metal-carbon composites are disclosed in the prior art references applied against the original claims in paragraphs 5, 8, 11 and 14 of the Office Action (discussed above), it is respectfully submitted that there is no disclosure or suggestion of a carbide layer, as recited in claim 101. Furthermore, none of the above-discussed prior art

references discloses or suggests adding an element, which reacts with the carbon or graphite, to form the carbide layer, as recited in claims 102 and 103 (each of which depend directly or indirectly from pending claim 101).

For all the foregoing reasons, applicants respectfully submit that all pending claims herein define patentable subject matter over the art of record.

The Examiner is requested to confirm receipt and consideration of the Information Disclosure Statements:

August 13, 2001
October 5, 2001
October 24, 2002
November 6, 2002
December 30, 2002

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

February 26, 2003
Date

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